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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/559,944 | BAEK ET AL. | |
| | Examiner | Art Unit | |
| | SATISH CHANDRA | 1716 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *23 February 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1 - 3, 5 - 29* is/are pending in the application.

4a) Of the above claim(s) *7, 16, 17, 23 - 29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 – 3, 5, 6, 8 – 15 and 18 – 22* is/are rejected.

7)☒ Claim(s) *1 - 3, 5, 11, 16, 18 and 21 – 29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 February 2010* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/21/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Objections*

Claims 1 - 3, 5, 11, 16, 18 and 21 – 29 are objected to because of the following informalities: All these claims recite “currently amended" while no amendment has been made to any of these claims.

The Examiner recommends removing the words “currently amended" from each of these claims.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1, 3, 5, 8, 11 - 13, 15 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056).**

**Shim discloses: regarding claim 1,** an atomic layer deposition apparatus having a reaction chamber for forming a thin film on a plurality of substrates 160 rested on a susceptor 151 (Fig 3, whole disclosure), the apparatus comprising: a gas supply means 100 for supplying a plurality of gases (abstract) to the inside of the reaction chamber from the outside, the gases including a reaction gas;

a gas distribution means for distributing and spraying the gases supplied from the gas supply means so as to conform to the purpose of a process;

a gas retaining means 131 – 134 (Figs 5 – 8) having a plurality of reaction cells 131 - 134 for partitionally accommodating and retaining the respective gases distributed from the gas distribution means; a rotation driving means 170 for rotating selectively the susceptor such that the gases retained in the respective reaction cells are exposed to the substrates in sequence; and a gas exhaust means 154 for pumping the gases retained by the gas retaining means to the outside of the reaction chamber. Shim discloses that invention relates to ALD equipment in which a thin layer is formed proportionally to the number of reaction cycle by the surface concentration of each reactant injected on the substrate surface. After one reactive gas is chemically absorbed , the second or the third gas comes in and a thin layer is formed on the substrate while the chemical absorption again occurs. The gases are alternately supplied on the substrate surface.

**Regarding claim 3,** the gas supply means 100 supplies at least two or more reaction gases and a purge gas.

**Regarding claim 5,** a gas supply means 100 (Fig 3) comprising an upper panel 110 and a plurality of reaction cells 132 - 134 partitioned in there. It is inherent that the upper panel comprises an upper plate.

**Regarding claim 8, Shim discloses:** the injection grooves (reaction cells) in Figs 6 and 7 are disposed in the upper gas panel comprising an outer peripheral wall (not labeled) connecting the end portions of the partition walls.

**Regarding claim 11,** the speed of rotation of the susceptor 151 in which the wafer 160 is settled in the top is desirable in the range of 5 rpm to 200 rpm.

**Regarding claim 12, Shim discloses:** the gas distribution means includes; a fixing means 133e (Fig 7) for fixing the gas retaining means 131a ; a distribution main body 135 (Fig 5) inserted into the central portion of the upper plate and closely contacting the respective partition walls; a gas inlet ports formed (not shown) in the distribution main body such that gases supplied from the gas supply means are individually introduced; a distribution chamber fluid-communicated with the gas inlet ports and having a desired space formed therein for partitionally accommodating the respective gases; and a plurality of lateral spray ports (not disclosed) formed in the later face of the distribution main body such that the gases accommodated in the distribution chamber are sprayed to the lateral faces of the respective reaction cells.

**Regarding claim 13, Shim discloses:** the purge gas is further provided with a downward spray port 133c (Fig 8b). Further supply an inert gas to any of the grooves is the intended use of the apparatus and the apparatus of Shim is capable of supplying an inert gas to any of the grooves, including through the downward spray port 133c.

**Regarding claim 15, Shim discloses:** the distribution chambers (reaction cells) to which the gases are supplied, are fluid communicated with each in their distribution chamber.

**Regarding claim 21,** a remote plasma generator (not shown) is connected to the gas supply area for generating radicals.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shim et al (KR unexamined publication 10-2003-0086056) as applied to claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Hwang et al (US 6,634,314).**

**Shim et al was discussed above and discloses: regarding claim 2,** the gas retaining means is connected at its central portion with the lower end of the gas distribution means

**Shim et al does not disclose: regarding claim 2**, the reaction cell being integrally rotated together with the gas distribution means.

**Hwang et al discloses: regarding claim 2,** a rotating showerhead (Fig 3) comprising a vapor injection pipes 308a – 308d (reaction cells).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a rotating showerhead in the apparatus of Shim et al as taught by Hwang et al.

The motivation for providing a rotating showerhead in the apparatus of Shim et al is to uniformly distribute the process gases to form a uniform thin film on the substrate surface in the apparatus of Shim as taught by Hwang.

**Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shim et al (KR unexamined publication 10-2003-0086056).**

**Shim et al was discussed above.**

**Regarding claim 6, Shim discloses:** an octagonal shaped upper gas panel 110 (Fig 6) wherein the partition walls are installed in radial direction (the boundary section of the injection grooves 312 – 134 in Fig 6).

**Shim does not disclose: regarding claim 6**, a circular gas panel. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a circular gas panel in the apparatus of Shim et al.

The motivation for providing a circular gas panel in the apparatus of Shim et al is to provide an alternate and equivalent shape of the upper gas panel in the apparatus of Shim et al. Further it has been held in *re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)* that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

**Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shim et al (KR unexamined publication 10-2003-0086056) as applied to claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Horie et al (US 6,132,512).**

**Shim does not disclose: regarding claim 9,** the partition wall is further provided at both the lower end sides thereof an extension plate extending in parallel to the susceptor so that the gas mixing between the neighboring reaction cells is prevented.

**Horie et al discloses: regarding claim 9,** in Figs 4 and 5, guide plates 12 extending downwardly for preventing the gases from leaking laterally are attached to the respective opposite side edges of the lower panel of the gas ejection head 10.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide guide plates extending in parallel to the susceptor for preventing the gases from leaking laterally in the apparatus of Shim et al as taught by Horie et al.

The motivation for providing the guide plates extending from the reaction cell partition walls is to prevent the gases from leaking laterally (preventing the gases from mixing) in the apparatus of Shim as taught by Horie.

**Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shim et al (KR unexamined publication 10-2003-0086056) in view of Horie et al (US 6,132,512) as applied to claim 9 above and further in view of Tei et al (US 6,929,830).**

**Shim and Horie do not disclose: regarding claim 10,** the spacing between the extension plate and the substrate is maintained below 3 mm while not contacting each other.

**Tei et al discloses:** a plasma processing apparatus wherein the gap Tg between the showerhead surface and the upper surface of the substrate is less than 10 mm (more specifically less than 50 mm and much less than 10 mm), any reaction by-products produced in the space A can be quickly removed with exhaust gas so that the formed film will be practically free from pin holes and hence of high quality.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a spacing between the extension plate and the substrate is less than 10 mm in the apparatus of Shim and Horie.

The motivation for providing a spacing between the extension plate and the substrate is less than 10 mm in the apparatus of Shim and Horie is to optimize the spacing between the extension plate and the substrate surface for providing a smaller space for confining and removing the gases from the space in their apparatus.

**Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shim et al (KR unexamined publication 10-2003-0086056) in view of Horie et al (US 6,132,512) as applied to claim 9 above and further in view of Ahn et al (US 2006/0000412).**

**Shim and Horie do not disclose: regarding claim 10,** the spacing between the extension plate and the substrate is maintained below 3 mm while not contacting each other.

**Ahn discloses:** a processing apparatus wherein the distribution plate comprises projection wall 134 (wall extension) extending vertically downward from the distribution plate (fig 1). Ahn further discloses in Para 0041 the inner chamber is smaller in volume than chamber 100 and thus requires less gas and less fill time to achieve desired chemical concentrations (assuming all other factors equal.) More precisely, the exemplary embodiment provides an inner chamber with an empty volume in the range of 70 to 350 cubic centimeters, based on a 1-to-5 millimeter inner-chamber height and a fixture with a 30-centimeter diameter. Additionally, the number and arrangement of

holes in the fixture as well as the placement of the holes close to the substrate, for example within five millimeters of the substrate, promote normal gas incidence and uniform distribution of gases over the targeted portion of substrate 200.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the spacing between the extension plate and the substrate is maintained between 1 – 5 mm while not contacting each other in the apparatus of Shim and Horie as disclosed by Ahn et al.

The motivation for providing the spacing between the extension plate and the substrate is maintained between 1 – 5 mm while not contacting each other in the apparatus of Shim and Horie is to provide uniform gas distribution to promote normal gas incidence in their apparatus as disclosed by Ahn et al

**Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shim et al (KR unexamined publication 10-2003-0086056) as applied to claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Watanabe et al (US 2005/0017100).**

**Shim does not disclose: regarding claim 14,** the fixing means include a plurality of connection grooves formed in the distribution main body and a connection protrusion formed in on end portion of the respective partition walls so as to be inserted and connected into the connection groove.

**Watanabe discloses: regarding claim 14,** a nozzle plate member for supplying fluids in dispersed manner comprising a peripheral protrusion 13 (Fig 2, Para 0082)

and a groove 25 to provide a secured sealing between the plates to prevent the leakage of the fluids.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a fixing means comprising a protrusion and a groove for providing a connection between plates in the apparatus of Shim et al as taught by Watanabe.

The motivation for providing a fixing means comprising a protrusion and a groove for providing a connection between plates in the apparatus of Shim et al is to provide an alternate and equivalent fixing means in the apparatus of Shim as taught by Watanabe.

**Claim 18 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) as discussed in claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Okase (US 5,884,009).**

**Shim et al does not disclose: regarding claim 18,** a restriction plate is installed in such a way as to be protruded along the inner peripheral face of the reaction chamber so as to be closely contacted with the upper periphery of the susceptor when it ascends, and the gas exhaust means is installed such that gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell can be pumped through an exhaust port, the reaction chamber being restricted by the ascending susceptor.

**Okase discloses: regarding claim 18,** a wafer support table 130 is supported for vertical movement in the vessel 100. Vertical cylindrical walls 131 are formed in a

peripheral part of the wafer support table 130 so as to overlap the cylindrical walls 122 (restriction plate) of the gas diffusing plate 120 when the wafer support table 130 is raised to a processing position.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a restriction plate, installed in such a way as to be protruded along the inner peripheral face of the reaction chamber so as to be closely contacted with the upper periphery of the susceptor when it ascends, and the gas exhaust means is installed such that gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell can be pumped through an exhaust port, the reaction chamber being restricted by the ascending susceptor.

The motivation for providing a restriction plate, installed in such a way as to be protruded along the inner peripheral face of the reaction chamber so as to be closely contacted with the upper periphery of the susceptor when it ascends, and the gas exhaust means is installed such that gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell can be pumped through an exhaust port, the reaction chamber being restricted by the ascending susceptor is to optimize the apparatus of Shim to provide a small confine space in their apparatus for carrying out a reaction.

**Claim 18 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) as discussed in claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Saeki et al (US 5,223,001).**

**Shim et al does not disclose: regarding claim 18,** a restriction plate is installed in such a way as to be protruded along the inner peripheral face of the reaction chamber so as to be closely contacted with the upper periphery of the susceptor when it ascends, and the gas exhaust means is installed such that gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell can be pumped through an exhaust port, the reaction chamber being restricted by the ascending susceptor.

**Saeki discloses: regarding claim 18,** in Figs 1 – 4 , a restriction plate (not labeled, part of the ceiling surface) disposed in the upper wall of the chamber 1 comprising an o-ring 8 forming a small space when the susceptor assembly is 5 raised (Fig 1). Saeki further discloses providing a small exhaust pipe 9 for pulling vacuum in the small processing space above the restriction plate.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a restriction plate in the apparatus of Shim as disclosed by Saeki.

The motivation for providing a restriction plate in the apparatus of Shim is to provide a mechanism for supporting the susceptor assembly in the raised position, forming a small processing space in the apparatus of Shim as disclosed by Saeki.

**Claim 18 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) as discussed in claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Reynolds (US 6,183,564).**

**Shim et al does not disclose: regarding claim 18,** a restriction plate is installed in such a way as to be protruded along the inner peripheral face of the reaction chamber so as to be closely contacted with the upper periphery of the susceptor when it ascends, and the gas exhaust means is installed such that gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell can be pumped through an exhaust port, the reaction chamber being restricted by the ascending susceptor.

**Reynolds discloses: regarding claim 18,** in Figs 1A, 1B , a restriction plate 45 disposed in the upper wall of the chamber 22 comprising an o-ring 42 forming a process space 23 when the substrate stage 30 is raised (Fig 1B). Reynolds further discloses providing a vacuum pump 50 for pulling vacuum in the small processing space above the restriction plate 45.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a restriction plate in the apparatus of Shim as disclosed by Reynolds.

It would also be obvious to a skilled artisan that the gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell can be pumped through an exhaust port, the reaction chamber being restricted by the ascending susceptor in the apparatus of Shim.

The motivation for providing a restriction plate in the apparatus of Shim is to provide a mechanism for supporting the susceptor assembly in the raised position, forming a small processing space in the apparatus of Shim as disclosed by Saeki.

The motivation for pumping the gas in a space between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell through an exhaust port, the reaction chamber being restricted by the ascending susceptor in the apparatus of Shim is to exhaust the gases between the inner peripheral face of the upper space of the reaction chamber and the outer periphery of the reaction cell.

**Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of Okase (US 5,884,009) as discussed in claim 18 above and further in view of Yudovsky (US 6,821,563).**

**Shim and Okase were discussed above.**

**Shim and Okase do not disclose: regarding claim 19,** a plurality of pumping cell partitioned to no more than the peripheral length of the reaction Cell; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells.

**Yudovsky discloses: regarding claim 19,** in Figs 1, 2, a vacuum pump (not shown) connected to each reaction cell via holes 155 wherein partition plates 160 is disposed separating the reaction cells (not labeled, regions for precursor A, purge gas, precursor B).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a plurality of pumping cell comprising partition plates; and an exhaust pump for pumping gases through an exhaust port connected

with the respective pumping cells in the apparatus of Shim and Okase as taught by Yudovsky.

The motivation for providing a plurality of pumping cell comprising baffle plates; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells in the apparatus of Shim and Okase is to limit cross contamination between the reaction gases in their apparatus as taught by Yudovsky.

**Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of Saeki et al (US 5,223,001) as discussed in claim 18 above and further in view of Yudovsky (US 6,821,563).**

**Shim and Saeki were discussed above.**

**Shim and Saeki do not disclose: regarding claim 19,** a plurality of pumping cell partitioned to no more than the peripheral length of the reaction Cell; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells.

**Yudovsky discloses: regarding claim 19,** in Figs 1, 2, a vacuum pump (not shown) connected to each reaction cell via holes 155 wherein partition plates 160 is disposed separating the reaction cells (not labeled, regions for precursor A, purge gas, precursor B).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a plurality of pumping cell comprising partition plates; and an exhaust pump for pumping gases through an exhaust port connected

with the respective pumping cells in the apparatus of Shim and Saeki as taught by Yudovsky.

The motivation for providing a plurality of pumping cell comprising baffle plates; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells in the apparatus of Shim and Saeki is to limit cross contamination between the reaction gases in their apparatus as taught by Yudovsky.

**Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of Reynolds (US 6,183,564) as discussed in claim 18 above and further in view of Yudovsky (US 6,821,563).**

**Shim and Reynolds do not disclose: regarding claim 19,** a plurality of pumping cell partitioned to no more than the peripheral length of the reaction Cell; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells.

**Yudovsky discloses: regarding claim 19,** in Figs 1, 2, a vacuum pump (not shown) connected to each reaction cell via holes 155 wherein partition plates 160 is disposed separating the reaction cells (not labeled, regions for precursor A, purge gas, precursor B).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a plurality of pumping cell comprising partition plates; and an exhaust pump for pumping gases through an exhaust port connected

with the respective pumping cells in the apparatus of Shim and Reynolds as taught by Yudovsky.

The motivation for providing a plurality of pumping cell comprising baffle plates; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells in the apparatus of Shim and Reynolds is to limit cross contamination between the reaction gases in their apparatus as taught by Yudovsky.

**Claim 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of Reynolds (US 6,183,564) as discussed in claim 18 above and further in view Yoder (US 5,281,274).**

**Shim and Reynolds do not disclose: regarding claim 19,** a plurality of pumping cell partitioned to no more than the peripheral length of the reaction Cell; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells.

**Yoder discloses: regarding claim 19,** a first vacuum sub-chamber 28, a second reactant gas sub-chamber 30 or a second vacuum sub-chamber 32. The aforementioned sub-chambers 26, 28, 30 and 32 are integrally affixed to the growth reactor chamber 12 (see FIG. 2).Yoder further discloses (Figs 1, 2), a first high capacity vacuum pump 38 and its associated control valve 40 are both operatively connected to the top of the growth reactor chamber 12 via a pipeline 42. The pipeline 42 connects to the growth reactor chamber 12 via a tailpipe 44. The tailpipe 44 is integrally affixed to each of the sub-chambers 26, 28, 30 and 32 so as to form a portion thereof. A first

plurality of vent holes 46 are configured in the tailpipe 44 so that they exit into the first vacuum sub-chamber 28. Likewise a second plurality of vent holes 48 are configured in the tailpipe 44 so that they exit into the second vacuum sub-chamber 32. These vent holes allow the first high capacity vacuum pump 38 to better maintain the proper operating pressures in the aforementioned vacuum sub-chambers, i.e., at lower operating pressures than the pressures in the reactant gas sub-chambers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a plurality of pumping cell comprising partition plates; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells in the apparatus of Shim and Reynolds as taught by Yoder.

The motivation for providing a plurality of pumping cell comprising baffle plates; and an exhaust pump for pumping gases through an exhaust port connected with the respective pumping cells in the apparatus of Shim and Reynolds is to limit cross contamination between the reaction gases in their apparatus as taught by Yoder.

**Claim 20 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of Okase (US 5,884,009) and Yudovsky (US 6,821,563) as discussed in claim 19 above and further in view of Komino et al (US 6,156,151) and Ishihara et al (US 2005/0167052).**

**Shim, Okase and Yudovsky do not disclose: regarding claim 20,** the pumping cell includes: a primary exhaust passageway formed in a space above the restriction plate; a separation plate having a plurality of through-holes formed above the

primary exhaust passageway; and a secondary exhaust passageway formed in a space above the separation plate and connected with the exhaust port.

**Komino discloses:** an exhaust pump 124 is coupled to an exhaust plate 112 comprising exhaust holes 112a, disposed above the distribution plate 104.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an exhaust pump above the distribution plate above the restriction plate in their apparatus.

The motivation for providing an exhaust pump above the distribution plate above the restriction plate in their apparatus is to provide an alternate and equivalent location of the exhaust pump in their apparatus as taught by Komino.

**Shim, Okase, Yudovsky and Komino do not disclose:** a separation plate disposed between the primary exhaust plate and the exhaust port.

**Ishihara discloses:** a separation plate 52 disposed between the primary exhaust plate 51 and the exhaust port 4. A primary exhaust passageway is formed in the space above the restriction plate and a secondary exhaust passageway is formed in the space between the separation plate and the exhaust port.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in the apparatus of Shim, Okase, Yudovsky and Komino as taught by Ishihara.

The motivation for providing an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in

the apparatus of Shim, Okase, Yudovsky and Komino is to optimize their apparatus for exhausting gases as taught by Ishihara.

**Claim 20 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of in view of Saeki et al (US 5,223,001) and Yudovsky (US 6,821,563) as discussed in claim 19 above and further in view of Ishihara et al (US 2005/0167052).**

**Shim, Saeki and Yudovsky do not disclose: regarding claim 20,** the pumping cell includes: a primary exhaust passageway formed in a space above the restriction plate; a separation plate having a plurality of through-holes formed above the primary exhaust passageway; and a secondary exhaust passageway formed in a space above the separation plate and connected with the exhaust port.

Ishihara discloses: a separation plate 52 disposed between the primary exhaust plate 51 and the exhaust port 4. A primary exhaust passageway is formed in the space above the restriction plate and a secondary exhaust passageway is formed in the space between the separation plate and the exhaust port.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in the apparatus of Shim, Saeki and Yudovsky as taught by Ishihara.

The motivation for providing an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in

the apparatus of Shim, Saeki and Yudovsky is to optimize their apparatus for exhausting gases as taught by Ishihara.

**Claim 20 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of in view of Reynolds (US 6,183,564) and Yudovsky (US 6,821,563) as discussed in claim 19 above and further in view of Ishihara et al (US 2005/0167052).**

**Shim, Reynolds and Yudovsky do not disclose: regarding claim 20,** the pumping cell includes: a primary exhaust passageway formed in a space above the restriction plate; a separation plate having a plurality of through-holes formed above the primary exhaust passageway; and a secondary exhaust passageway formed in a space above the separation plate and connected with the exhaust port.

**Ishihara discloses:** a separation plate 52 disposed between the primary exhaust plate 51 and the exhaust port 4. A primary exhaust passageway is formed in the space above the restriction plate and a secondary exhaust passageway is formed in the space between the separation plate and the exhaust port.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in the apparatus of Shim, Reynolds and Yudovsky as taught by Ishihara.

The motivation for providing an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in

the apparatus of Shim, Reynolds and Yudovsky is to optimize their apparatus for exhausting gases as taught by Ishihara.

**Claim 20 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) in view of in view of Reynolds (US 6,183,564) and Yoder (US 5,281,274) as discussed in claim 19 above and further in view of Ishihara et al (US 2005/0167052).**

**Shim, Reynolds and Yoder do not disclose: regarding claim 20,** the pumping cell includes: a primary exhaust passageway formed in a space above the restriction plate; a separation plate having a plurality of through-holes formed above the primary exhaust passageway; and a secondary exhaust passageway formed in a space above the separation plate and connected with the exhaust port.

**Ishihara discloses:** a separation plate 52 disposed between the primary exhaust plate 51 and the exhaust port 4. A primary exhaust passageway is formed in the space above the restriction plate and a secondary exhaust passageway is formed in the space between the separation plate and the exhaust port.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in the apparatus of Shim, Reynolds and Yoder as taught by Ishihara.
The motivation for providing an exhaust plate above the restriction plate and provide a separation plate between the primary exhaust plate and the exhaust port in the

apparatus of Shim, Reynolds and Yoder is to optimize their apparatus for exhausting gases as taught by Ishihara.

**Claim 22 is rejected under 35 U.S.C. 102(b) as being anticipated by Shim et al (KR unexamined publication 10-2003-0086056) as applied to claims 1, 3, 5, 8, 11 - 13, 15 and 21 above and further in view of Toyoda et al (JP 2002-324760).**

**Shim et al does not disclose:** among the reaction cells, at least one reaction cell, to which a reaction gas is supplied, is further provided with a plasma excitation means for plasma-exciting a reaction gas inside the reaction cell, the plasma excitation means being electrically connected with an external RF power application device at the face thereof corresponding to the upper portion of the substrate.

**Toyoda discloses: regarding claim 22 ,** a processing apparatus (Figs 1A, 1B, 2A, 2B) comprising an inlet for a plurality of reaction gases such as mono- Silane, SiH4 with mono-Germane GeH4 wherein electrodes 5 (plasma generating device, Fig 1B) including a gas introducing nozzle (not labeled) and a plasma introducing nozzle 7 (hydrogen discharge tube, Fig 2B) for generating hydrogen plasma is disposed in the space where substrates are processed. Gases are exhausted through an exhaust pipe 18. Fig 2B discloses plasma 15 is generated inside the distribution plenum 7. Electrode 5 is connected with an external RF power device 12.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an electrode to produce plasma inside at a distribution plenum in the apparatus of Shim as taught by Toyoda.

It would also be obvious to a skilled artisan to provide an electrode to produce plasma in at least one reaction cell in the apparatus of Shim and Toyoda.

The motivation for providing an electrode for producing plasma in at least one of the reaction cell is to optimize the apparatus of Shim and Toyoda by providing plasma in one of the reaction cells as an alternate and equivalent way of providing a plasmarized cleaning gas in their apparatus.

### *Response to Arguments*

Applicant's arguments filed 2/23/2010 regarding claims 1 – 3, 5, 6, 8 – 15 and 18 – 22 have been fully considered but they are not persuasive.

**Regarding the arguments:**

Rejections under 35 U.S.C. §102
The Office Action rejects claims 1, 3, 5, 8, 11-13, 15, and 21 under 35 U.S.C. § 102(b) as being anticipated by KR 10-2003-0086056 to Shim et al. (hereinafter "Shim").~ Applicants respectfully traverse this rejection and request reconsideration of the claims for at least the following reasons.
Shim does not disclose each and every feature recited in independent claim 1. Specifically, Shim does not disclose "a gas supply means for supplying a plurality of gases to the inside of the reaction chamber from the outside, the gases including a reaction gas," as recited in independent claim 1 (emphasis added).
The Office Action asserts that Shim discloses a gas supply part 100 (see Shim, Fig. 3) and members 131-134 (see Shim, Figs. 5-7) that allegedly correspond to the above-recited features (see Office Action, pages 3 and 4). Applicants disagree with this assertion for at least the following reasons.
Shim suffers from some of the same maladies as the prior art described within the specification. Specifically, Shim suffers from the amount of time required for an appropriate amount of a reaction gas and an inert gas to reach the substrate. For example, Shim discloses that gas supply part 100 is located at the upper portion of a rotary disc part 170 and supplies gas into a reaction chamber (see Shim, Abstract). However, Shim's gas supply part 100 does not supply a plurality of gases, including a reaction gas, to the inside of the reaction chamber, because the reaction gas jet parts and the inert gas jet parts comprising the stick- type members 131-134 that form the injection grooves are alternately installed at the gas supply part 100 (see Shim, Abstract). Indeed, once one of the reaction gas injector or the inert gas injector is alternately installed in place of the other, the corresponding reaction or inert gas, as the case may be, but not both, is directly injected on the surface of the wafer. Subsequently, the other of the reaction gas or inert gas injector is installed and the corresponding gas is injected. Consequently, Shim does not disclose "a gas supply means for supplying a plurality of gases to the inside of the reaction chamber from the outside, the gases including a reaction gas," as recited in independent claim 1 (emphasis added).

The Examiner disagrees:

At the outset, Shim discloses an ALD (atomic layer deposition apparatus and method) in which it is inherent to supply first and second reaction gases alternately to form atomic layers of each reactant on the substrate surface. Shim discloses (whole disclosure) that that their invention relates to ALD equipment in which a thin layer is formed proportionally to the number of reaction cycle by the surface concentration of each reactant injected on the substrate surface. After one reactive gas is chemically absorbed , the second or the third gas comes in and a thin layer is formed on the substrate while the chemical absorption again occurs. Shim discloses the first and the second reactive gas are supplied alternately to the first wafer, the second wafer, the third wafer and the fourth wafer. This cycle is repeated to form a desired thickness of the layer on the wafer surfaces. The reason for injecting the inert gas is to ensure the reactant gases do not mix with each other (applicant please read the whole disclosure of Shim reference).

The applicant has not provided any other arguments including the claims rejected under 103.

## *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SATISH CHANDRA whose telephone number is (571)272-3769. The examiner can normally be reached on 8 a.m. - 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, Primary Examiner, Ram Kackar can be reached on 571-272-1436. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Satish Chandra/
Examiner, Art Unit 1716

/Ram N Kackar/
Primary Examiner, Art Unit 1716